Aggregation and Databases

Announcements

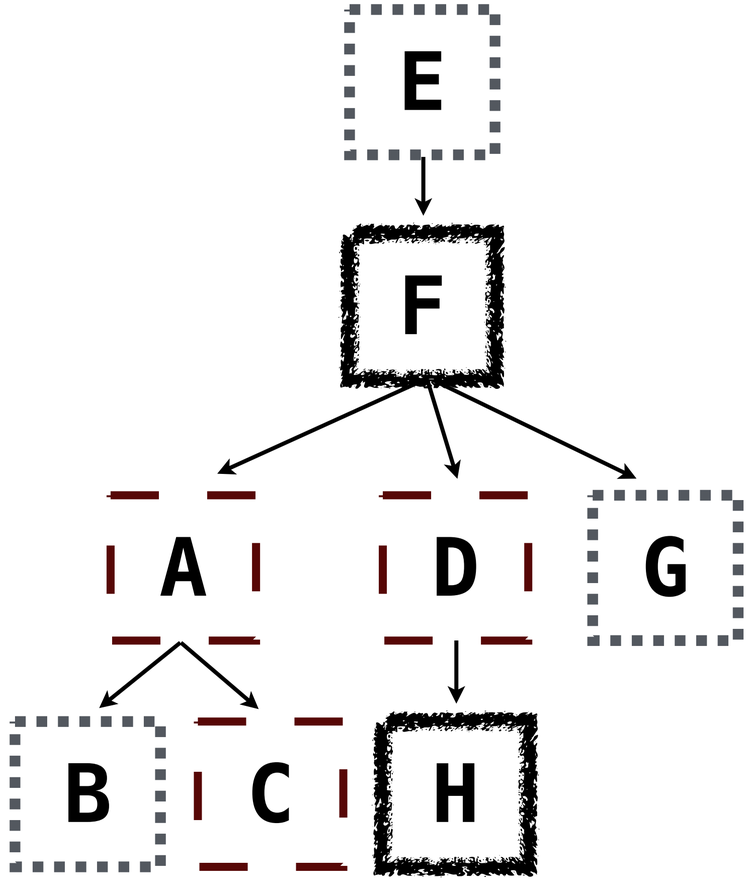
Example: Dog Triples

Fall 2014 Quiz Question (Slightly Modified)

Write a SQL query that selects all possible combinations of three different dogs with the same fur and lists each triple in *inverse* alphabetical order

```
CREATE TABLE dogs AS
  SELECT "ace" AS name, "long" AS fur UNION
  SELECT "bella"      , "short"       UNION
  ...;

CREATE TABLE parents AS
  SELECT "ace" AS parent, "bella" AS child UNION
  SELECT "ace"          , "charlie"        UNION
  ...;
```



Expected output:

```
daisy|charlie|ace
ginger|ellie|bella
```

(Demo)

String Expressions

(Demo)

Aggregation

Grouping Rows

Rows in a table can be grouped, and aggregation is performed on each group

```
[expression] AS [name], [expression] AS [name], ...
```

```
SELECT [columns] FROM [table] GROUP BY [expression] HAVING [expression];
```

The number of groups is the number of unique values of an expression

```
SELECT legs, MAX(weight) FROM animals GROUP BY legs;
```

legs	max(weight)
4	20
2	12000

legs=4

legs=2

(Demo)

animals:

kind	legs	weight
dog	4	20
cat	4	10
ferret	4	10
parrot	2	6
penguin	2	10
t-rex	2	12000

Writing Select Statements

Describe the output table:

1) Determine which existing rows are needed to express the result (FROM & WHERE)

2) Form groups and determine which groups should appear as output rows (GROUP BY & HAVING)

3) Format the output rows (SELECT)

SELECT: Values each output row contains (and column labels)

- **FROM:** Source of input rows
- **WHERE:** Which input rows
- **GROUP BY:** Form output rows
- **HAVING:** Which output rows

Break: 5 minutes

Joins Practice

Practice Question

What's the maximum difference between leg count for two animals with the same weight?

Approach #1: Consider all pairs of animals.

```
SELECT MAX(a.legs - b.legs) AS difference
  FROM animals AS a, animals AS b
 WHERE a.weight = b.weight;
```

Approach #2: Group by weight.

```
SELECT MAX(legs) - MIN(legs) AS difference
  FROM animals
  GROUP BY weight
  ORDER BY difference DESC
  LIMIT 1;
```

animals:

kind	legs	weight
dog	4	20
cat	4	10
ferret	4	10
parrot	2	6
penguin	2	10
t-rex	2	12000

difference
2

Practice Question 2

What are all the kinds of animals that have the maximal number of legs?

```
sqlite> SELECT * FROM animals WHERE legs = MAX(legs);
Parse error: misuse of aggregate function MAX()
```

animals:

kind	legs	weight
dog	4	20
cat	4	10
ferret	4	10
parrot	2	6
penguin	2	10
t-rex	2	12000

Approach #1: Give the maximum number of legs a name.

```
CREATE TABLE m AS SELECT MAX(legs) AS max_legs FROM animals;

SELECT kind FROM animals, m WHERE legs = max_legs;
```

Approach #2: For each kind of animal, compare its legs to the maximum legs by grouping.

```
SELECT a.kind FROM animals AS a, animals AS b GROUP BY a.kind HAVING a.legs = MAX(b.legs);
```

Group By Practice

Spring 2023 CS 61A Final Question 7

The finals table has columns hall (strings) and course (strings), and has rows for each lecture hall in which a course is holding its final exam.

The sizes table has columns room (strings) and seats (numbers), and has one row per unique room on campus containing the number of seats in that room. All lecture halls are rooms.

Create a table with two columns, course (string) and seats (number), and with one row containing the **name of the course** and the **total number of seats in final rooms** for that course. Only include a row **for each course that uses at least two rooms for its final.**

finals:

hall	course
RSF	61A
Wheeler	61A
RSF	61B

sizes:

room	seats
RSF	900
Wheeler	700
310 Soda	40

result:

course	seats
61A	1600

```
SELECT course, SUM(seats) AS seats
  FROM finals, sizes
  WHERE hall=room
  GROUP BY course
  HAVING COUNT(*) > 1;
```

Come to Special Topics next week!